Ontario
Waste Management
Corporation
System
Development
Project

The Proctor & Redfern Group

OWMC

Primary Information—

Transportation

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Dear Sir

Transportation - Primary
Information Study

We are pleased to present the final report of the Transportation - Primary Information.

This report presents an overview of the road and rail transportation systems through describing their operational characteristics, their ability to provide for transportation of waste, and the information processes for monitoring the movement of commodities in the system.

It also describes the information that will be used for input to the transportation analysis and identifies some considerations in the identification and evaluation of alternative waste management sytems.

Yours very truly

Proctor & Redfern Limited

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Vice-President

WDG:sm
Encl.

TRANSPORTATION - PRIMARY INFORMATION

OWMC FACILITIES DEVELOPMENT PROCESS

ONTARIO WASTE MANAGEMENT CORPORATION

August, 1982

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ONTARIO WASTE MANAGEMENT CORPORATION

BACKGROUND INFORMATION

The Ontario Waste Management Corporation (OWMC) is a provincial crown agency created in 1981 by the Ontario government to establish a liquid industrial waste and hazardous waste management system for the province. One of the first tasks of the Corporation was to examine the possibility of constructing a treatment and disposal facility at South Cayuga in the Regional Municipality of Haldimand-Norfolk. Preliminary hydrogeological studies of the site revealed that it had several short-comings and the Board of Directors of OWMC voted unanimously to reject the site in November 1981.

Following the rejection of the South Cayuga site, OWMC developed a corporate plan which incorporated:

- The need to design and build a waste treatment and disposal system to manage safely liquid industrial waste and hazardous waste not presently receiving adequate treatment and disposal in Ontario.

- The need to assist Ontario industries in identifying additional, practical ways to reduce and/or recycle liquid industrial waste and hazardous waste.

- The need to consult with the public on the nature and scope of the industrial waste problem and how it can be remedied.

Before a treatment and disposal facility is built, detailed proposals must be presented to an independent Hearing Panel appointed by the Ontario Government, and public hearings will be held.

OWMC is not a regulatory agency, nor is it responsible for treating and disposing of domestic or radioactive wastes.

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1.0 INTRODUCTION

The transportation of waste to treatment and disposal facilities will have a significant influence on the annual operating costs and the public acceptance (i.e. minimum risk) of OWMC activities. The analysis of other issues in the development of the waste management system will be examined in terms of their impact on these two components.

The transportation analysis will therefore focus on transportation costs and the minimization of risks. Logically this analysis will be done at least three times before the planning process is complete. The first analysis will be undertaken to assist in choosing preferred waste management systems from amongst a larger number of possible alternatives (i.e. for further and detailed study).

A second more detailed analysis will be undertaken after the locations of site areas for the several preferred systems facilities have been chosen. This analysis will assist in the identification of the selected system, (i.e. the system that will be the subject of the OWMC proposal); and finally an in-depth analysis will be undertaken upon the system selected, and the data and conclusions will be embodied into the documentation of OWMC's proposal.

It is obvious that the transportation analysis for the facilities development process must be and is reactive to information supplied by other disciplines. Descriptions of alternative systems encompassing the type and location of facilities under consideration, and, the type, quantity and location of wastes generated are required first.

2.0 PURPOSE OF THIS DOCUMENT

Data collected to date and observations and certain conclusions are presented in this report, in order to:

- present an overview of the road and rail transportation systems through describing the operational characteristics of each
- describe the ability of these systems to provide for the transportation of waste
- describe the information processes for monitoring the movement of commodities in the system
- describe the information that will be used for input to the transportation analysis
- describe transportation systems considerations that may prove to be useful in the identification and evaluation of alternative waste management systems.

3.0 CONCLUSIONS

3.1 The Transportation Network

- This preliminary review of the Ontario transportation network is by no means a complete evaluation at this time. However, we can state the following preliminary conclusions:

  Road systems under provincial jurisdiction should be used wherever possible, when selecting haul routes. The principle reasons are that roadways under other jurisdictions may have links that are not continuous and roads that have less suitable geometric design and structural standards. A result of using local roads, i.e. under other jurisdictions, could be higher operating cost, higher risks and greater difficulty in enforcement of regulations. It must be recognized, however, that some parts of local road systems must be used to provide access to the provincial highway system from the points of origin of the waste, and perhaps to certain OWMC facilities. The Provincial Highway system provides a continuous linkage of roadways between all cities and towns.

- The road network currently provides more extensive coverage of the Province than does the rail network. More extensive coverage means there is a greater flexibility in the choice of routes and the provision of access to specific sites. While the rail network may be less extensive than the road system, but it too represents a viable haulage network that provides excellent access to many areas and may have some use in the transportation of waste depending upon the quantity and type of material transported, the location of the waste generator and OWMC facilities, and finally pricing structures.

- Marine and pipeline transport systems may have specific roles once more details are available on possible system options. However, it is anticipated that their roles will be relatively limited.

3.2 Inspection Procedures

- Inspection procedures on highway systems are in place for truck inspection, and vehicles transporting waste will be subject to that inspection. However, the current inspection program may not be comprehensive enough, since the surveillance is periodic, trucks can bypass inspection facilities and The Ministry of Transportation and Communications (MTC) staff are not specifically trained for a comprehensive inspection of waste vehicles.

- Inspection procedures are in place for railway systems and are designed to safeguard the integrity of the train and rolling stock. Railway Companies appear to be seriously determined to detect and respond to problems through their inspection programs, which are seen to be comparable to those in place for the highway system.

4.0 TRANSPORTATION SYSTEMS

The Waste Quantities Study has identified major waste generator locations on an area by area basis. As one would expect, waste generators are, for the most part, typically located in or adjacent to the more densely populated regions of the province, or in areas where there is relatively easy access to high quality transportation systems.

The following sections of this report will outline various characteristics of the transportation system within the province as it relates to the movement of wastes from major generators to some other area for treatment and disposal.

A glance of a map of Ontario will indicate that there is a very extensive road and rail network within the Province. Obviously to summarize the operation of each would be a very extensive process which may have little relevance. Once alternative waste management systems are identified along with the general location of both principle and ancillary facilities, the transportation analysis will evaluate the risk and cost associated with these options. For this reason, the analysis of transportation issues will be largely reactive in nature. However, this does not reduce the need to consider transportation concerns in the generation of alternatives.

The preliminary data collection phase of the analysis has focused on the transportation network connecting major waste generators. As the location of alternative treatment and disposal facilities becomes known, this information will be reviewed and expanded to include all feasible routes.

4.1 Provincial Highways

All Highways in this system are designed and maintained by standards established by the MTC. There are basically two types of roadways within this system. King's Highways in the 400 series, including the Queen Elizabeth Way, are suited for high speed travel for large volumes of traffic. Access to these roadways is normally limited to grade separated

interchanges. Roadway geometry and physical design reflect MTC's highest design standards.

Other King's Highways in the provincial system are typically two lane undivided roadways having lower standards. These roadways are less capable of providing for the high speed, high volume traffic movement, but do represent logical routes for the transportation of hazardous wastes in conjunction with the 400 series.

4.2 Other Streets and Highways within the Province

Within the Province of Ontario a number of other public agencies have jurisdiction over streets and highways, that is they are responsible for the design, construction and operation of public roadways. These agencies include regional or county governments in the upper level of government or local municipal authorities such as cities, towns and townships on the next level. Decisions respecting certain road links in the Provincial Highway System in built-up urban areas lie with these other agencies or local municipal authorities.

Within some metropolitan areas these roadways may be major expressways designed and maintained at standards similar to the King's Highways 400 series. Both the Gardiner Expressway and the Don Valley Parkway are examples of such roads. The remaining road system within local jurisdiction, is represented by a wide range of roads from six lane arterials with access control, to unpaved two lane rural roads with uncontrolled access.

Until locations of potential facilities have been fixed, roadways only under the jurisdiction of the province have been considered in the data collection process. At the present time, it is assumed that wastes would be transported directly to the Provincial Highway System by the quickest route possible to minimize the use of local road systems. As the location of possible waste management facilities is identified, the affected local road system will be examined and included in the network analysis.

4.3 Railways

In the Province there are extensive railway lines connecting many of the urban areas, particularly those areas of major waste generators. Unlike the major highway system which is owned and operated by the Province, most of the railways are owned and operated by one of three major companies, the Canadian National Railway, the Canadian Pacific Railway, the Ontario Northland Railway and the Algoma Central Railway. All railway operations are regulated by the Federal Government of Canada.

Similar to the road system, railway lines are constructed to standards according to the amount of traffic they carry. Accordingly, main railway lines have more stringent geometric and physical requirements to facilitate higher speeds, greater volumes and heavier loads. Standards currently in use by the Canadian railway companies may be set by the Transport Commission, or American Association of Railways.

4.4 Other Transportation Systems

Two other transportation systems which may have some relevance to the Facilities Development Process are marine transport and pipeline transport. As both of these modes are envisaged to have specific applications under special circumstances, information regarding these two modes will be presented once the alternative waste management systems are defined.

5.0 REVIEW OF EXISTING HIGHWAYS

5.1 Review of Existing Transportation Facilities

The annual average daily traffic (AADT) has been examined for connecting links between major generators. A review of the volume of traffic in the highways, indicate the obvious, that King's Highways approaching major centres usually service significantly more traffic than roads in rural areas.

Traffic volumes also vary significantly throughout the day. During the peak hour, traffic volumes usually represent between 10% and 15% of the total daily traffic. It is not uncommon for peak hour volumes to approach double the mid-day traffic volumes.

Highway 401 is the primary continuous roadway traversing the width of the Province, and further, this roadway passes through or nearby many of the most densely populated areas. This highway is utilized by both long distance and local traffic. In fact this characteristic use was so prominent in the Toronto area that collector lanes were added to improve the flow of through traffic and to reduce the possibility of conflicts between these two traffic types. As such, Highway 401, in combination with other 400 series highways represent the backbone of most of the Province's Highway System providing access between the major population and industrial centres in Ontario. The notable exception to this fact is the road service to Ottawa and environs from other parts of Ontario.

5.2 Highway Accidents

As part of its annual reporting procedure, MTC reports rates of accidents on accident per million vehicle kilometres of travel basis. Roadway accident data is recorded on all links of the highway system in a disaggregate format for each accident. Reports include a description of vehicle paths, type of vehicle, traffic controls in effect, visibility, injuries and more.

In our view, this information, summarized on a link by link basis, does not provide details that would allow a comprehensive understanding and thorough analysis of risks for each road section. However, in the absence of more appropriate information, these data will prove to be helpful in determining the relative risks associated with alternative facility site locations.

The accident data collected and on file would appear to indicate that:

(a) the accident rate for highways in the 400 series is lower than the remainder of the highway system;

(b) the accident rates tend to rise on the more heavily travelled sections of highway;

(c) some specific locations tend to be more accident prone than other locations (i.e. Skyway Bridge in Hamilton-Burlington area).

5.3 Highway Capacity and Level of Service

MTC also assembles and reports information on the operating characteristics of highways under its direct jurisdiction on a link by link basis. A review of the data indicates that Highways within Metropolitan Toronto and surrounding urbanized areas are operating at a low or poorer level of service. Congestion generally decreases in the network as the distance from major urban areas increase. There are many Ontario highways which continuously operate at a medium level of service throughout the day. However, there are exceptions to this, in that some sections of highway 401 are currently operating in the lower levels of service even though they are well removed from densely populated areas.

It should be noted that "level of service" is a gross measurement of the highway operating conditions, because the calculation of the level of service accounts for the traffic volumes and capacity restrictions imposed by highway geometrics. The importance of this information should not be overemphasized at this time in that principal transportation considerations should relate to risk and to cost rather than operating character.

5.4 Travel Times and Distance Between Major Waste Generators

Estimates of travel times and distance between major centres has been determined with the aid of computer analysis. For each highway link, average operating speed and distance information is known and will be used to estimate the time that a transport vehicle likely would spend on each section of road. The accumulated time and distance information from each source to all possible destinations can be calculated.

Once alternative systems have been described in more detail this information will be combined with haul cost information to determine the transportation costs associated with each alternative.

5.5 Conclusions

This transportation system information has been presented as an overview only. However, this network data can be useful in the development of alternative waste management system alternatives. The following is a list of conclusions, stemming from our observations, that should be considered when producing alternatives that will have less detrimental impacts on residents and industry and lower transportation costs. These include:

- Facility locations which would require extensive use of regional or municipal road system should have less preference.

- The Provincial Highway system in the 400 series should be considered as primary haul routes. Although these roads serve the greatest number of the travelling public, they also provide the highest level of service outside of peak operating periods. They reflect lower accident rates and they provide a high level of accessibility to generators and to proposed facilities and to emergency services. Finally, in many cases they will provide the most economic haul in terms of both time and distance.

- The highway system presents a more comprehensive network than rail, however, the shipment of waste by rail should be the subject of a further examination once more information is available respecting the type, location and quantity of waste to be processed.

- Marine and pipeline transport systems may have a more specific role once more details are available on possible system options.

6.0 CURRENT INSPECTION PROGRAMS

The review of inspection procedures on highway systems provides the following observations and conclusions:

6.1 Highway Transportation Inspection Program

- As part of the MTC Truck Inspection Program, vehicles transporting hazardous wastes and operating on the provincial highway system are subject to inspection under the following premises:

  - Mechanical and Safety Regulations
  - Regulations for Goods Movements
  - License and Registration Inspections
  - Gasoline/Diesel Oil Taxes

- The current MTC program does not provide continuous, comprehensive inspections for all vehicles and may not be totally suitable to OWMC for the following reasons:

  - surveillance is periodic

  - trucks can bypass inspection facilities

  - staff is not specifically trained for a comprehensive inspection of hazardous waste vehicles

  - comprehensive inspections of hazardous waste vehicles may not be feasible in that such inspections may affect MTC's ability to maintain the rest of the inspection program.

- Should OWMC wish to implement corporate policies establishing its own "in plant" inspection program for trucks arriving at the OWMC facilities, the existing highway vehicle inspection program could provide a supplementary role in providing a certain level of "in transit" inspections and in enforcing the use of the provincial highway system and/or specific routes.

6.2 Railway Transportation Inspection Program

- The majority of train inspections are completed by railway employees. While inspections are designed to safeguard the integrity of the train, and rolling stock, as with the highway program, it is not possible to detect all problems.

- Railway companies appear to be seriously determined to detect and respond to problems through their inspection programs.

- Inspection procedures for railways are established in part by federal regulation and in part by the railways themselves. As such, it is anticipated that OWMC may have a lengthy and difficult task in initiating change within current inspection procedures.

- The relative effectiveness of the highway and the railroad inspection programs cannot be evaluated; however, it is apparent that the level of inspection provided by the railway companies seem to be comparable to that for the highway system.

7.0 HAUL COSTS FOR WASTES

7.1 Factors Affecting Haul Costs

Rates for the transportation of materials by trucks are dependent upon a number of factors influencing the haul. Some of these factors are listed below:

- The current price of fuel and maintenance costs
- The type of material to be transported

  The origin and the destination of material to be transported or the trip length in distance or time.
- The detention time of vehicle for loading or unloading
- The time when delivery is required; week days, weekends or holidays
- The length and time taken to traverse detours, if encountered
- The dedication or otherwise of the equipment for the transport of specific substances; clean dry products, dirty liquids, toxic etc.
- The quantity of material to be transported
- The number of shipments per day
- Special equipment requirements.

7.2 Haul Cost Data

Haul costs are very sensitive to market conditions, type of material and quantity transported. Tariffs will be the most up to date available, to represent a true indicator of the current haul costs when evaluating haul costs for possible and probable system options (see Appendix, Table 1).

8.0 FURTHER ACTIVITIES TO BE UNDERTAKEN

8.1 Facilities Development

Information described in this report will be utilized in the analysis evaluation of alternative systems. To complete these analyses, a computer has been programmed to provide relevant travel times and distances from the yet to be determined waste generator to the treatment and disposal locations. Using cost data as described in Section 7.2, we will determine the impacts and costs of collection stations located at key locations in the transportation system. For each major waste generating area the cost implications of sending wastes to collection stations or direct to treatment will be determined. By doing this, the viability of centralized versus decentralized treatment and disposal facilities, when considered in combination with various configurations of collection stations, will be addressed.

8.2 Other Tasks

There are many other transportation considerations which must be dealt with during the planning of OWMC facilities. Many of these encompass the areas of policy development, transportation services management and the further reduction of risk. The evaluation of these considerations will require extensive data gathering in themselves. Four such subject areas are listed below:

- Haul fleet equipment and operations
- Equipment standards and specifications
- Transport legislation and regulation
- Risk minimization in fleet operation

As the Facilities Development Process continues, tasks to be undertaken in these ancillary subject areas will be defined and initiated. Some of the issues and concerns are identified in Section 9.0.

9.0 SOME TRANSPORTATION ISSUES AND CONCERNS

There are many issues that will be addressed as part of the transportation component of the Facilities Development Process. Exhibit A1 indicates a number of subject headings under which issues will emerge. Some of these issues have already been identified while others will be brought out as a result of further investigation or as a result of input received from the public. Some of the issues are very complex and must be considered in detail, others are not complex and may be dealt with very quickly by the application of common sense. However, we anticipate that many, if not all, of these issues must be addressed.

Waste Collection

- who should be responsible for delivery of wastes to OWMC facilities?
- should OWMC operate a truck fleet for collection of wastes?
- what extent of control over the waste collection should OWMC wish to obtain?
- should OWMC specify the type of containers to transport wastes to its facilities?
- what are the impacts of collection options on the waste generators?

Waste Transfer in the Event of Decentralized Facilities

- should OWMC operate a truck fleet, unit trains, slurry pipelines or a barge fleet?
- what extent of control should OWMC wish to exert over private operators and material handlers?

- what types of vehicles or containers should be required to complete this task?

Inspections and Impoundment

- should treatment and collection station operation emulate or surpass the practice of the Provincial Truck Inspection program?

- what is the level of involvement that can be expected from the Ontario Truck Inspection program?

- how is an intensive inspection program going to affect costs?

Travel Paths, Level of Service and Routing

- how should vehicles to be routed in order to reduce exposure to the travelling public?

- what steps can or should be taken to bypass or reduce the risk to the roadside communities?

- how are risks affected by locating facilities away from major generators?

Mode of Travel

- what are the various types of transportation vehicles under consideration?

- how should we address the safety implications of each mode?

- what can be done to improve the safety of each type of transportation vehicle?

Vehicle Types and Container Specifications

- to what degree will or should wastes be mixed to consolidate loads for transport?

- what types of containers are available for mixed or consolidated loads and what areas associated with those containers?

- should truck tractor-trailer trains be permitted in the transport of waste?

Operating Practices

- what is the optimal period of time and scheduling for hauling waste?

- what should the practice be during inclement weather?

- what should the practice be when trucks are parked or temporarily stopped while in transit?

- how should vehicles to be marked or placarded while in transit?

- what should maintenance standards and operating policies be as related to speed, mechanical fitness, etc.?

- what type of driver training monitoring programs should be in place?

- what type of truck monitoring programs should be in place to ensure trucks comply with corporate policies?

Emergency Response Program for Transport Accidents

- what are the abilities of existing organizations to facilitate this role?

- what actions can be undertaken to improve these existing organizations to establish a more comprehensive program?

- what is the extent of involvement to be undertaken by OWMC to ensure that its own requirements are satisfied?

- would the existing organizations and companies be included as part of any OWMC program.

Legislative or Operational Control of Transportation Services

- what level of control should be exhibited by OWMC over transportation by using existing or new legislation or by using operating policies?

- should OWMC compete with private carriers in the transport sector by operating its own fleet?

Monitoring Programs

- would the current Ontario Waybill system be maintained as the principal monitoring system for the transportation of hazardous wastes or should OWMC establish a separate program?

- should there be a monitoring program directed at the waste generation source locations to ensure that all wastes generated are known and are treated at source if not delivered to OWMC?

Accident Reporting Systems

- what should the emergency response procedure be in dealing with accidents?

- how should a clean-up operation proceed and who should have responsibility?

APPENDIX

EXHIBIT A1 - CLASSIFICATION OF TRANSPORTATION ISSUES

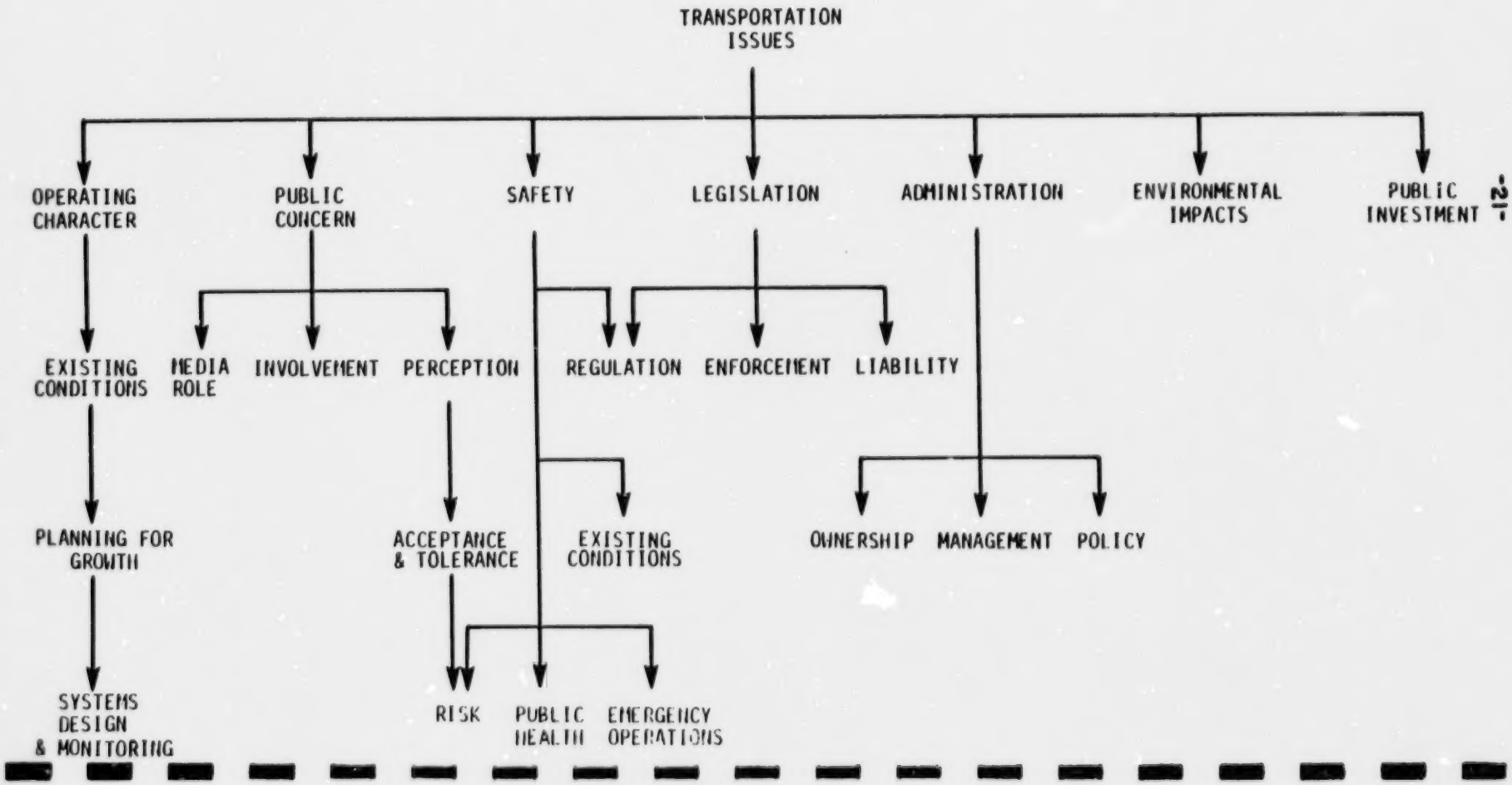

TABLE 1

Typical Haul Costs* for Materials (Preliminary)

Description of Items			Cost
1.	Cost per ton - minute of operation (prices vary by type of material and location)		9¢ to 13¢
2.	Cost per ton - mile of operation (prices vary by type of material and location)		11¢ to 18¢
3.	Vehicle standing time when loading or unloading of material exceeds one hour		$34.00/hr.

	4. Dedicated vehicle rentals	Tractor*	Trailer
	- voranol	$1.72/mi	$1,300.00 /month
	- ammonia	$1.20/mi	$ 850.00 /month
	- synthetic resin (2100 cu. ft.)	$1.72/mi	$ 825.00 /month

5. Sample Material Haul Tariff

Material	From	To	Costs*
Caustic Soda	Sarnia	Toronto	$1.465 /100 lbs.
Sugar	Oshawa	Leamington	$ .88 /100 lbs.
Fertilizer solutions	Niagara Falls	Toronto	$ .55 /100 lbs.
Sulfuric Acid	Niagara Falls	Toronto	$ .65 /100 lbs.
Crude Oil	Windsor	Toronto	$ 1.34 /100 lbs.

Notes:

1. Costs based upon minimum loads: from 50,000 lbs. (25 short tons)
   to 80,000 lbs. (40 short tons)

2. 3% Gasoline surcharge is added to all shipments

3. Tariffs are typically expressed in Imperial Units as of January 1982

*Sources: Canadian Transport Tariff
Burlaw Association